

Report of an Outbreak of Ringworm of the Scalp Due to *M. Audouini*

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SUMMARY

*Experience in Los Angeles County with an outbreak of ringworm of the scalp caused by *M. audouini*, and a review of the literature have led to the following conclusions:*

*Diagnosis: The Wood's lamp is an indispensable piece of equipment in case finding. While *M. audouini* infection is often characteristic in appearance, there are frequent variations. Culturing on Sabouraud's medium (glucose-agar) is a requirement for positive diagnosis. Most surveys show an infection ratio of six or seven boys to one girl.*

Treatment: X-ray epilation provides the best prospect for cure in the shortest time. Manual epilation can be employed but is less efficient and more disagreeable. Shaving the scalp every seven to ten days is helpful in preventing the spread of the infection but is not a satisfactory substitute for epilation. The most effective topical application is an ointment containing 5 per cent salicylanilide in carbowax 1500. All treatment should be conducted under trained supervision for constancy and thoroughness. Hormone therapy is in general to be discouraged.

Control: With proper supervision of treatment and adequate protective covering of the scalp, there need be no loss of school time after treatment has been instituted. Enlistment of the barbers of the community in refusing to serve clients with obviously infected scalps, and properly sterilizing instruments is important. Cutting instruments can be satisfactorily sterilized in petroleum oil at 100° C. without detriment to the instruments. Complete discipline must be maintained on school grounds with regard to exchange of head-gear between children.

RINGWORM of the scalp has been discussed quite comprehensively in the medical and public health literature during the past few years and has been reported from representative population centers from coast to coast. The epidemic status of the disease began on the East Coast about 1940 and

promptly and progressively pursued a westward course until it eventually was recognized to have arrived in Los Angeles County in 1946.

Just how many cases of ringworm of the scalp due to *M. audouini* it takes to make an epidemic may be a debatable point, but the appearance of a single case should be sufficient to incite at least a mild state of alarm among those members of the community concerned with the control of communicable diseases. It requires no exhaustive search of the literature for one to be impressed with the persistent and resistant qualities of *M. audouini* and to be forewarned that it gets into the hair administratively as well as pathologically.

For a symptomless affliction of the childhood population this disease certainly is capable of a most diabolical upset of the adult equanimity. The child with the moth-eaten appearance to his scalp is somewhat of an assault to the esthetic senses and, in spite of the completely negative mortality rate and the absence of physical suffering, this condition is prone to arouse a most agonizing mental reaction. Parents are the first to register alarm and this is rapidly transmitted to school authorities who in turn enmesh public health workers in spreading shadows of public concern. In the meantime, the child, who is the primary victim and has been pretty oblivious to his affliction, begins to register concern over the prospect of becoming bald at a very tender age; and, if he is of school age, this develops into a matter of real concern, particularly among girls.

But the ultimate upset occurs when the nature and duration of treatment are explained. At this point rebellion, hysteria, economics, and juvenile delinquency dominate the scene. To subject the victim to complete epilation of the scalp is a prospect that is strenuously resisted by both parent and child. And yet, total epilation is a procedure that is classified as a must.

Manual epilation, although it offers the advantage of economy, seems to border on the cruel and barbaric, and rarely is performed with satisfactory thoroughness. X-ray epilation offers the most satisfactory and efficient epilating procedure when applied with an approved technique, but offers the disadvantage of expense, insufficient technical resources to supply the demand, a small but uncomfortable percentage of failures, and inadaptability to the restless, uncooperative, or frightened child. It has often been observed that x-ray epilation needs to be supplemented by manual epilation. This method is widely regarded as the method of choice, and some observers insist that an epidemic cannot be brought under control without it. A compromise

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procedure consists of shaving the scalp every seven to ten days. This, however, does not accomplish the emptying of the hair follicle that is accomplished by x-ray.

All epilating procedures require a follow-up with topical application of an approved fungicidal ointment used with thoroughness and constancy over a minimum period of several months. The ointments that have achieved the best record of success contain 5 per cent salicylanilide in carbowax 1500, or copper undecylenate. One such preparation is known proprietarily as Salinidol. It is pretty generally acknowledged that the treatment of *M. audouini* infection deserves the services of a trained dermatologist.

Wilson and Plunkett¹⁸ reported the presence of the audouini type of tinea capitis in the Los Angeles area early in 1947 and warned of the imminence of an outbreak. It was about at this time that clinic services in the San Antonio district of the Los Angeles County Health Department began noticing a type of ringworm of the scalp that was exceedingly resistant to ordinary methods of treatment. We arranged for the examination of a number of cases by microscopic and cultural methods. With the positive diagnosis that ensued, immediate steps were taken to secure ultraviolet ray equipment with the Wood's filter and enough cases were found in the Bell Gardens area to impel a survey of the elementary school population of that community. A dermatologist was employed to conduct the survey and was assisted by public health nurses. During the fall of 1947, out of 2,829 scalps examined in five elementary schools with the Wood's light, 97 or 3.4 per cent fluoresced. Cultures free from contamination were obtained in 87 of these cases, of which 84 (96 per cent) were *M. audouini* and 3 (4 per cent) were *M. lanosum*. Only three cases were found in the junior high school. Experience in this survey revealed that nurses could very satisfactorily do the screening operation with the Wood's lamp and conserve the time and the effort of the dermatologist for the final Wood's lamp observation and the culturing operation.

Owing to the requirement of the Administrative Code of California under Title 5 on Education, that no pupil, while infected with any contagious or infectious disease, shall be allowed to remain in any of the public schools, it became necessary to exclude these children from school. Arrangements were made with the local school authorities for home teaching classes and the patients were referred to private medical practice for treatment. The relatively low economic level of the community resulted in very few cases coming under the supervision of dermatologists. Although an offer was made to perform x-ray epilation at reduced rate on patients with resistant cases, the limited resources of White Memorial Hospital where the treatment was to be given and the financial limitations of the patients combined to greatly limit the use of this procedure. As a consequence, the great majority of these cases were treated by topical applications on the shaven

head. With the patients excluded from school, the supervision of treatment could not be satisfactorily conducted, and great reliance had to be placed on cooperation by the parents. Each patient was urged to come to the health center every two weeks for examination and inspection with the Wood's light.

A review early in January, 1948, of the 97 cases diagnosed in the survey revealed:

Returned to school as cured.....	18
Still excluded from school.....	62
Moved from the area and unavailable for interview....	17
Cases treated under health department observation with Salinidol.....	39
Cured within 3 months.....	9
Still under treatment.....	30
Under treatment less than 2 months.....	15
Under treatment 2 to 4 months.....	15
Discovered subsequent to survey.....	17
Preschool cases secondary to survey cases.....	8

Of the 62 still excluded from school:

3 had been out less than 1 month
2 had been out between 1 and 2 months
23 had been out between 2 and 3 months
34 had been out between 3 and 4 months

Of the 18 returned to school:

6 were out less than 1 month
5 were out 1 to 2 months
6 were out 2 to 3 months
1 was out 3 to 4 months

Summary of absence from school:

80 per cent were out more than 2 months
44 per cent were out more than 3 months

This summary is of no more significance than to emphasize an already well-established observation that treatment of *M. audouini* infection by topical application is a time-consuming procedure extending over a period of many months.

Swartz and Peck¹⁵ and their co-workers in the epidemic at Hagerstown, Maryland, have reported in some detail their complete success in eradication of the disease in that town in one year using topical applications without recourse to epilation by x-ray. This was accomplished without excluding children from school and by setting up a treatment center operated by trained personnel at each of the city's seven schools to ensure proper daily treatment.

It has been generally observed from the experience in other areas that x-ray epilation is the most efficient method from the standpoint of time and certainty of cure. There has been a sufficient experience to ensure its safety when the five-point technique of Kienböck and Adamson¹ is used. Cipollaro states that one radiologist can treat about 3,000 patients in one year.³

In view of the fact that spread of the infection is attributed to the scattering of infected hairs, it would seem that there should be no epidemiological necessity for excluding from school any patient in whom the disease has been diagnosed and brought under proper treatment. By permitting school attendance after treatment has been instituted better control can be exercised over the constancy and effectiveness of the treatment, the loss of school time

is brought to a minimum and, to that extent at least, juvenile delinquency is prevented. With a tight-fitting stocking cap to cover the epilated and ointment-covered scalp, and a headgear of aviator type for the boys and a scarf or turban for the girls, the communicability has been brought to the vanishing point as long as these precautions are observed.

Our survey of the grade school population did not progress as rapidly as we would have liked, because of the slowness with which the Wood's light has become available. The variation in cycles of the electrical current in different communities also was an obstacle. Equipment designed for use with 60-cycle electricity is not usable with 50-cycle electricity, and vice versa. When we surveyed the East Los Angeles area where the income level is relatively low and the foreign element is high, we expected to find a considerable number of cases. We were, therefore, somewhat surprised when only a single case was discovered in more than 2,000 examinations, although this community is only five miles distant from Bell Gardens where a moderately heavy infestation was found. In the Alhambra-El Monte area, which lies an additional five to ten miles away from the Bell Gardens area in the same direction as East Los Angeles, we examined 5,185 pupils in six schools. Here we discovered only two cases of audouini infection and seven cases of lanosum. Proceeding with our survey on the same radial line, we examined 2,242 pupils in eight schools of the foothill region of Monrovia and Duarte about 15 to 20 miles from Bell Gardens. Here we have found 21 cases positive to Wood's lamp examination, of which 16 were proved to be due to *M. audouini*. Two preschool children were found with the infection in the families of the infected school children. Up to the present time we have examined 12,493 scalps with a yield of 164 cases of *M. audouini* infection confirmed by culture, or 1.3 per cent. The Bell Gardens area accounted for 63 per cent of the yield.

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Discussion by L. S. GOERKE, M.D., Los Angeles

In the spring of 1947 the Los Angeles City Health Department, using Wood's lamps, examined 1,381 children attending five parochial schools. From this survey, 14 children with suspicious scalp lesions or fluorescent hairs were referred to our central clinic for examination by the dermatologist, and cultures were prepared for microscopic diagnosis by the mycologist. Ten (0.7 per cent) of the children originally examined were found to have tinea capitis, with *M. audouini* confirmed in eight (0.6 per cent). One year later, these same schools were examined by the same nursing personnel with the following results:

School	1947		1948	
	Number Examined	Audouini Cases	Number Examined	Audouini Cases
Cathedral	460	0	478	0
Queen of Angels.....	282	0	300	0
St. Lawrence.....	224	5	268	2
St. Patrick's.....	135	3	193	1
St. Joseph's.....	280	0	255	0
Total.....	1,381	8	1,494	3

The patients were permitted to return to the parochial schools, provided they remained under treatment of a dermatologist or one of our treatment clinics and followed the recommendations and instructions of the clinics. It is interesting to note that there were only two new cases out of a school population of 1,494 children examined.

At the end of the first school survey a three-hour seminar on tinea capitis was conducted by several public health dermatologists at our Southeast Clinic, May 22, 1947, for public health personnel and private physicians. Cases of various types of tinea capitis were demonstrated by several commercial types of Wood's lamps, together with cultures and microscopic exhibits. It was shown that there is a decided difference in fluorescence by the various Wood's lights, with one type of equipment much more efficient. At present we are

using several Keese Engineering Wood's lamps, which has been our choice up to this point, although other companies have been improving their filters. To provide our district health officers with some type of black light, while procuring more efficient equipment, purple X (perflex) bulbs, costing \$1.25, were used in goose neck lamps with fine wire mesh protectors. With these bulbs we picked up a few cases of tinea capitis, but probably missed many more. The first of a special floor model Wood's lamp which eliminates most of the inconveniences of lamps previously used is being tried in one of our clinics.

As Dr. Gilbert has stated, the Wood's lamp is indispensable in case finding. It is also of value in following the progress of therapy and in evaluating cures. We have learned the necessity of having an expert, preferably a mycologist, examine the cultures. The final diagnosis is sometimes delayed three weeks for a good culture to grow.

One of our clinic teams—dermatologist, laboratory technician, nurse and clerk—conducted demonstrations for school physicians and nurses. Since then continuous surveys have been in progress in the public schools and these have resulted in the discovery of 115 cases.

One hundred eighty-five cases were diagnosed in the Los Angeles City Health Department clinics during the first year's experience with tinea capitis; 25 cases were in pre-school children (child health clinics, outside referrals, fam-

ily contacts); 24 were in children attending parochial schools, and 136 were in pupils at public schools.

Most of the cases were found in the Central, Watts, and Southeast areas, which are high population density, low income areas. This is where we have concentrated the case finding program. Other areas are involved, but at the present time the extent is undetermined.

The age of the patients ranged from 2 to 12 years, with males predominating five to one. Duration of the infection ranges from two weeks to one year. Epidemiological investigation as to barber shops, theatres and churches has revealed no common source of infection.

As Dr. Gilbert stated, x-ray epilation provides the best prospect for cure in the shortest time. However, this service is difficult to obtain. The Los Angeles Dermatological Society appointed a committee to investigate the subject and to meet with the radiological section of the County Medical Association. Extreme caution because of extreme sensitivity to the medicolegal aspect was very evident. It was decided after considerable discussion that the procedure was safe and that if a precedent were established legal hazards would disappear and x-ray clinics to meet the need would follow. White Memorial Hospital has set the precedent, but the free, part-pay x-ray epilation clinics or services, where the greatest need exists, have not followed. Therefore, the health department has the responsibility of operating daily clinics, not only for diagnosis, but for treatment.

